VOL. 14 JANUARY, 1941 NO. 1

Journal

OF THE

Kansas Entomological Socie

PUBLICATION COMMITTEE
PAUL B. LAWSON, Editor, Lawrence
R. H. BEAMER, Lawrence R. H. PAINTER, Manhattan
DWIGHT ISELY, Fayetteville, Ark.

JAMES WALKER McCOLLOCH
1889-1929

Entered as second-class matter June 7, 1939 at the Post Office at Manhattan, Kansas, under the Act of August 24, 1912

Kansas Entomological Society

Volume 14 January, 1941 Number 1

James Walker McColloch

James Walker McColloch, whose likeness appears on the Journal cover, was born at Anthony, Kansas, April 14, 1889. He died November 11, 1929, at Manhattan, Kansas. He was graduated from the Kansas State College in 1912. During his undergraduate work in 1910 and 1911, he was employed by the college as a special field agent, and began his entomological investigations on the chinch bug, Hessian fly and corn earworm. In 1912 he was appointed Assistant Entomologist of the Kansas Agricultural Experiment Station. It was soon discovered that Mr. McColloch was a man of unusual research ability and a good teacher. His bulletins on the chinch bug and Hessian fly, scientific papers on the chinch bug egg parasites, dust sprays for the control of the corn earworm, and the dispersal of the Hessian fly by wind, attracted wide attention and received favorable comment. His ability and usefulness was recognized by the college by promoting him, in 1918, to the position of Associate Professor of Entomology and Associate Entomologist of the Kansas Agricultural Experiment Station. His research was expanded to include studies of soil-inhabiting insects, insect ecology, and the resistance of plants to insect attack. In those studies he soon established for himself an enviable reputation and was regarded by the entomologists as one of the outstanding research men in economic entomology. He received the degree of Master of Science from the Kansas State College in 1923. During the absence of the head of the Department of Entomology of the Kansas State College from 1923-1925, Professor McColloch was acting head of the department, acting entomologist of the Kansas Agricultural Experiment Station, and acting State Entomologist. Here he demonstrated his ability as an executive. In 1925 he was promoted to a full professorship.

Professor McColloch was absolutely trustworthy, dependable and loyal. During the twenty years that he was connected with the Department of Entomology of the Kansas State College, he was always willing to carry more than his share of the work. He possessed the rare ability of quickly analyzing a situation, particularly an insect outbreak, and seldom erred in his judgment. His whole life was one of service and he was most happy when serving others. In spite of his pressing duties in entomological work, he found time to devote considerable attention to his duties in the Masonic Lodge, the Congregational Church, his community, his committee work in

scientific societies, the editorial work of the Kansas Agricultural Experiment Station, the Journal of the Kansas Entomological Society and the Biological Abstracts. Professor McColloch was a member and an active worker in the American Association for the Advancement of Science, American Association of Economic Entomologist, Entomological Society of America, American Microscopical Society, Kansas Entomological Society, Kansas Academy of Science, and Kansas State College Chapters of Sigma Xi, Phi Kappa Phi, Gamma Sigma Delta, and Alpha Zeta.

Professor McColloch's earnest desire for economic entomology to develop on that broad and constructive plane so necessary for the rendering of the maximum service and usefulness was well illustrated by his leading part in the inauguration and the participation in meetings of entomologists, such as the North Central States Entomologists, Rocky Mountain Conference of Entomologists, and the Kansas Entomological Society, engaged in similar entomological problems.

The fine generosity and vision of professional service of Professor McColloch were largely instrumental in determining the practice of free exchange of plans of investigations and unpublished information on entomological investigations conducted by workers interested in Hessian fly, chinch bug, corn earworm, white grubs, and other staple crop insects.

In his untimely death, entomology suffered an incalculable loss, and his asscciates and co-workers in the United States, Canada and many foreign countries felt intimately the loss of his fine personality, fellowship and stimulating influence.

—GEO. A. DEAN

NOTICE

The seventeenth annual meeting of the Kansas Entomological Society is to be held at the Kansas State College, Manhattan, Kans., on April 5, 1941. Titles for papers to be presented at that meeting should be sent before March 1, 1941, to the secretary, Mr. D. A. Wilbur, Dept. of Ent., K. S. C., Manhattan. Please specify the time to be allowed for the presentation of the paper and indicate whether a lantern is to be used.

R. L. PARKER, President

SOME RECENT WORKS ON THE CLASSIFICATION OF IMMATURE INSECTS[1]

Wm. P. Hayes, Urbana, Illinois

With the recent publication of two rather comprehensive keys to the orders of immature insects by Peterson (1939) and by Metcalf and Flint (1939) has come the thought that it would be well to bring together references and make some comment on other recent papers of this kind that will aid the student in finding keys for the identification of the various developmental stages of insects. There have been published a number of useful keys to immature stages in recent years. Some of these are in obscure periodicals and are easily overlooked by the average entomologist. Hence a bringing together of the more important of these citations should prove of value.

The study of the taxonomy of immature stages has never and probably never will keep pace with that of adult forms because of the immensity of the task of discovering and associating properly the young and the imago of the enormous number of species now known only in the adult stage. We shall always be confronted with the problem of identifying larvae, pupae, nymphs and even eggs and when an unknown immature is before us, unless it is a familiar species, we can resort to the tedious process of rearing it to adulthood and identifying it from adult keys, or else make use of our available keys to the comparatively few known developing stages. To anyone who has worked with keys of this nature, it is well known that they are notable for their incompleteness, are often difficult to use and chances are that, more often than not, the user may have for identification a specimen that has not been seen or studied and not therefore included in the key. A further difficulty is evidenced by the fact that the more our knowledge grows of these immature forms the more necessary it is going to become to construct a key for every instar which the immature stages pass through. A few keys of his nature are in existence and are of two kinds, those such as Riley and Johannsen (1932) have given us to all instars of the cyclorrhaphous Diptera of medical importance and others that are keys to the various instars of a given species. Notable among the latter is a key to the instars of **Melanoplus mexicanus** by Shotwell (1930) and those of Nevin (1929a and 1929b) to the instars of certain species of the odonate genera **Agrion** and **Sympetrum.** Such studies as these indicate that eventually it may be necessary in many groups to construct instar keys for the various species as they become known before we can

[1]Contribution No. 211, Department of Entomology, University of Illinois.

have a completely comprehensive key to the group in question. Hence in life history studies, it should be part of any thorough work the making known of all developmental changes as they occur from instar to instar. Such knowledge is especially important in orders like Lepidoptera where there are changes of coloration, ornamentation and setal patterns from instar to instar.

Classwork in the taxonomy of immature insects is now being offered to students at a number of institutions and it is being realized, more and more, the necessity of more and better studies in the field. With the hope that other investigators will become interested in such studies and to point out to others who have not followed the literature of this kind the following is offered to indicate some, but not all, of the considerable number of new papers in the field. It is not intended to be a complete bibliography and only comparatively recent papers have been noted. These are accompanied by some comment on a few little known older keys.

General Keys to Orders:—Our immature keys to orders may be said to be of two kinds—those of a general nature, including either all the orders or all those orders having complete metamorphosis and excluding those with gradual metamorphosis and those, of which there are many, that include the orders that are aquatic. Our two most recent keys, as mentioned above, by Peterson (1939) and Metcalf and Flint (1939) are of the more general type and include keys to orders of pupae. Strangely enough, both these keys are based on an unpublished key by A. D. MacGillivray which he used in his classes at the University of Illinois before his death. The two published versions of this key are quite useful but not without faults. A general key that is little known is an earlier work by Allee and Shelford (1923) in which are keys to nymphs, larvae and pupae of the freshwater and terrestrial orders of the "moist temperate region of North America." The University of Chicago Press has just (Dec. 1939) announced the publication of a revised and extended edition of this work entitled "A laboratory introduction to animal ecology and taxonomy," under the authorship of Park, Allee and Shelford. Chrystal (1937) in an English book entitled "Insects of the British Woodlands" has produced a general key to the principal types of insect larvae. It is based, in part, on food habits or so-called "biological types" and excludes specialized forms such as leaf-miner and unusual dipterous types.

A number of works exist which contain keys to aquatic insect orders. A recent one it that of P. R. Needham (1938) in a book entitled "Trout Streams" in which nymphs and larvae of aquatic orders are distinguished. Karny's (1934) German work on "Biologie die Wasserinsekten," (biology of water insects) is one that contains general keys as well as keys to several aquatic orders. An unpublish-

ed key to orders has been produced by the workers of the U. S. National Museum which is quite useful.

Smaller Orders:—Among the smaller orders of insects with gradual metamorphosis the only noteworthy recent taxonomic works have been with the aquatic nymphs (naiads) of the orders Plecoptera, Odonata and Ephemeroptera. The nymphs of Plecoptera have been studied taxonomically by Claassen (1931) and Frison (1929, 1935 and 1937). Of these the work of Claassen covers the more extensive North American fauna while Frison's studies are limited to the fauna of the state of Illinois.

In the Ephemeroptera the monographic work of Needham, Traver and Tsu (1935) is our most extensive North American study on the Mayflies. This volume not only distinguishes the nymphs but also contains a key to the known eggs of the order. Traver (1932-1933) has published keys to the nymphs of the species occurring in North Carolina and in other papers has produced keys to species of the genus **Hexagenia** (1931) and to genera of the **Heptagenine** Mayflies (1933). The species of **Leptophlebia** have been keyed by Gordon (1933).

For the Odonata, Needham and Heywood's "Handbook of the Dragonflies of North America" published in 1929 remains the comprehensive work treating of immature stages. Only smaller articles have appeared since. Some of these are works of Walker (1933) on the Canadian species of **Ophiogomphus** and Byer's (1936) key to the genera of Corduliinae and Libellulinae. A somewhat earlier but still quite usable set of nymphal keys is in Garman's (1927) Odonata of Connecticut. In Europe, Schmidt (1936) has keyed the nymphs of **Leucorrhinia.**

Hemiptera:—Most nymphal keys to this order are concerned with the aquatic species. A recent key to the fourth and fifth instar nymphs of European species of **Gerris** is that of Mitis (1937).

Neuroptera:—Townsend (1935) has given us a key to the families and in some instances subfamilies of the Neuroptera. Two notable volumes on this order are those of Killington (1936-37). This work deal with the immature stages of **Plannipennia** and gives a key to larval families found in Great Britain.

Trichoptera:—Betten (1934) has a family key to this order and Milne (1939) has given us another key to the larval families.

Lepidoptera:—Our standard general keys for the identification of larval Lepidoptera are the older works of Fracker (1915) and Forbes (1923). These are keys to families. A number of keys to genera and species of various families exist. A new family key has been published by Gerasimov (1937a) in the German language. This

key has been translated into English and will be used by the writer's students in identifying immature insects this coming semester. Gerasimov appears to be the only active worker who is publishing regularly on larval forms of this order. Three of his recent papers (1937b, 1937c and 1937d) discuss and key the larvae of Psychidae, Hepialidae and of the genera **Stigmella (Nepticula)** and **Tischeria.** Comparatively recent American studies on cutworms (Noctuidae) have been those of Crumb (1929 and 1934) and Whelan (1935). A key to European species of the genus **Notodonta** has just been published by Hanson (1939) and one to four species of **Agrotis** by Fiedler (1937).

Coleoptera:—The monumental work of Böving and Craighead (1930) on the larvae of North American Coleoptera will be a standard for years to come. It is a general work which keys beetle larvae to families and in some cases subfamilies. This comprehensive study of the higher groups has apparently been a stimulus to others for we have more new works appearing that deal with the lower categories of beetle larvae than any other order. Other general works cannot be overlooked: the old family key of MacGillivary (1903) has been republished and somewhat revised by Balfour-Browne (1932). This simplified key treats only of the common families. A more extensive key to families is that of Rymer-Roberts (1930). Both the works of Böving and Craighead and of Rymer-Roberts consider details of structure particularly of the mouthparts and their keys are difficult for the novice to use. A fairly recent key to families, and one that has been overlooked is that of Blair (1934) which is rather extensive in scope, but based, in great part, on habits rather than structure.

Papers covering more restricted groups of beetle larvae have been numerous lately. A number of European keys that are not generally known are those of Guignot (1931-33), Karny (1934) and Bertrand (1928) which are extensive works on aquatic families; Butovitch and Lehner (1933) have keyed the coleopterous larvae of the soil in pine forests; Saalas (1923) has a more general account of beetle-larvae in pine forests of Finland; Van Emden (1938) an extensive work to certain groups of curculionid larvae and Rymer-Roberts (1939) has treated the larval Eryotilidae. Henning (1938) has produced keys to subfamilies, genera and species of the most important German Chrysomelidae. A little known key to the subfamilies of the larvae and pupae of Chrysomelidae is that of Patterson (1931). Two recent American keys to species of certain genera of Staphylinidae are those of Voris (1939a and 1939b). Ritcher (1938 and 1940) has published keys to larvae of the scarabaeid genus **Phyllophaga** found in Kentucky and at present Dr. Böving is at work on a more inclusive key to this genus of white grubs which we hope will be published soon. Böving and Henderson (1938) have recently issued an extensive work on larval Hydrophilidae of Denmark. The

writer recently translated an earlier German work on carabid larvae by Von Emden and had been planning to make the translation available to American students but after looking over the translation and the available specimens, Dr. Van Emden has taken up the task of revising this key and it is hoped that it will soon appear and in all probabilty will be published in English.

Hymenoptera:—This order has been neglected as far as general keys to families are concerned. The only work of such a nature is that of Brues and Melander (1932) which is based, in part, on the earlier work of Yuasa (1922) on the Chalogastra and on the habits rather than structures of the common families of Clistogastra. Only a few recent keys to divisions of this order have appeared. One pertaining to the genera of two parasitic families is a not generally known work by Bakkendorf (1934) that which treats the families of Mymaridae and Trichogrammidae. Another is Ritcher's (1933) key to larval bumblebees. Cameron (1938) working in England, studied the parasites of the pea moth and worked out keys to the primary larvae, mature larvae and cocoons of several parasitic genera. He has also done the same (1939) for the parasites of the Holly Leafminer except that there are keys for the pupae instead of cocoons.

Diptera:—The writer has recently (Hayes, 1938-39) published a bibliography of works in this order that contains keys to the immature forms. Some overlooked citations to older papers were not included in this list. These have been called to my attention by a few correspondents. Most are obscure works on mosquitoes. It is hoped that these, with the addition of a few more recent papers, can be brought together in the form of a supplement to the original list. Some of the recent papers not included in the list of this order are here cited. Leeson (1939) has given us a recent fourth instar key to West African mosquitoes. Wells and Knipling (1938) have second and third keys to species of bots in horses. Thienemann (1939) has larval and pupal keys to the genus **Psectrocladius** and other recent papers on the chironomid group and DeMeijere (1938) a larval key to species of Agromyzidae inhabiting vetch (**Vicia**). Evans (1938) has a key to larval Anopheline mosquitoes of Ethiopia; Carpenter (1939) has published keys to the larval mosquitoes of Arkansas, while Owen (1937) has a key to those of Minnesota.

Perhaps the most important recent works with keys to immature American Diptera cited in the bibliography referred to above are the series of papers by Johannsen (1934, 1935, 1937) on aquatic Diptera and those in Riley and Johannsen's (1932) text book, "Medical Entomology" that distinguish larval Diptera of medical importance. The classic in this order is the early work of Malloch (1927) which now needs revision and whose second part has never been published that

was to have dealt with the Cyclorrhapha. This group is of great importance as larvae and one that has never been thoroughly treated from the taxonomic standpoint. Most of the available works in this division of the Diptera pertain to those groups of medical importance. Large families such as the Tachinidae and Anthomyiidae and others present fertile fields for research.

REFERENCES CITED

Allee, W. C. and Shelford, V. E.
1923. Synoptic key to phyla, classes, and orders of animals with particular reference to fresh water and terrestrial forms in moist regions of North America. University of Chicago Press. 63 pp.

Bakkendorf, F.
1934. Biological investigations on some Danish hymenopterous egg parasites, especially homopterous and heteropterous eggs, etc. Ent. Meddeleser 19: 1-134.

Balfour-Browne, F.
1932. A text-book of practical entomology. Longmans, Green and Co., N. Y., and Arnold and Co., London, 191 pp.

Bertrand, H.
1928. Les larves et nymphes des Dytiscides, Hygrobiides et Haliplides. Ency. Entom. Vol. 10. 368 pp.

Betten, C.
1934. The caddis-flies or Trichoptera of New York State. N. Y. State Mus. Bul. 292, pp. 1-576.

Blair, K. G.
1934. Beetle larvae. Proc. and Trans. So. London Ent. and Nat. Hist. Soc. for 1933-34 pp. 89-110.

Böving, A. G. and Craighead, F. C.
1930. An illustrated synopsis of the principal larval forms of the order Coleoptera. Ent. Amer., 11: 1-351.

Böving, A. G. and Henderson, K. L.
1938. The developmental stages of the Danish Hydrophilidae. Vidensk. Medd. fra Dansk. naturh. Foren., Bd. 102. pp. 27-162.

Brues, C. T. and Melander, A. L.
1932. Classification of insects. A key to the known families of insects and other terrestrial arthropods. Bul. Mus. Comp. Zool., Vol. 73, 672 pp.

Butovitch, B. and Lehner W.
1933 Bestimmungstabelle der wichtigsten in märkischen kiefernwaldböden verkommenden insektenlarven. J. Springer, Berlin. 16 pp.

Byers, C. G.
1936. The immature form of **Brachymesia gravida,** with notes on the taxonomy of the group. (Odonata:Libellulidae) Ent. News, 47: 35-37, 60-64

Carpenter, S. J.
1939. The mosquitoes of Arkansas. Arkansas State Board of Health. mimeog. 89 pp. 31 figs.

Chrystal, R. N.
1937. Insects of the British Woodlands. Warne and Co. Ltd. London. 338 pp.

Claassen, P. W.
1931. Plecoptera nymphs of North America. Thomas Say Foundation. Thomas Co., Springfield, 199 pp.

Crumb, S. E.
1929. Tobacco cutworms. U. S. D. A., Tech. Bul. 88, pp. 1-179.
———1934. A classification of some noctuid larvae of the sub-family Hypeninae. Ent. Amer., 14 (n. s.): 133-197.

DeMeijere, J. C. H.
1938. Die larven Agromyzinen (Vierter Nachtrag). Tijdschrift voor Ent., 81: 61-99.

Fielder, H.
1937. Die wichtigsten schädlichen erdraupen der gattung Agrotis. Inaug. Diss. Friedrich Wilhelms Univ. Berlin. G. Feller, Neubrandenburg.

Forbes, W. T. M.
1923. The Lepidoptera of New York and neighboring states. Cornell Agr. Exp. Sta., Memoir 68, pp. 1-729.

Fracker, S. B.
1915. The classification of lepidopterous larvae. Ill. Biol. Monog. 2: 1-161.

Frison, T. H.
1929. Fall and winter stoneflies, or Plecoptera, of Illinois. Ill. State Nat. Hist. Surv., Bul. 18: 343-409.
———1935. The stoneflies, or Plecoptera, of Illinois. Ill. State Nat. Hist. Surv. Bul. 20: 281-471.
———1937. Descriptions of Plecoptera with special reference to Illinois species. Ill. State Nat. Hist. Surv. Bul. 21: 78-99.

Garman, P.
1927. Guide to the insects of Connecticut. Part V. The Odonata or dragonflies of Connecticut. Conn. Geol. and Nat. Hist. Survey Bul. 39. 331 pp.

Gerasimov, A. M.
1937a. Bestimmungstabelle der familien von schmetterlingsraupen. Stett. Ent. Zeit., 98: 281-300.
———1937b. Beiträg zur systematik der Psychiden auf grund der erforschung der raupen (Lepid.) Zool. Anz., 120: 7-17.
———1937c. Zur systematik der raupen von Stigmella Schrank (Nepticula) und Tischeria Z. (Lepid.) Ent. Rundschau, 55: 89-91.
———1937d. Hepialiden raupen (Lepid.). Ent. Zeit., (Frankfurt). 51: 81-84.

Gordon, E. L.
1933. Notes on the ephemerid genus Leptophlebia. Bul. Brook. Ent. Soc., 28: 115-130.

Guignot, F.
1931-33. Les Hydrocanthares de France. Hygrobiidae, Haliplidae, Dytiscidae et Gyrinidae de la France Continental. Ent. Soc. France. Mscl. Ed., Les Freres Douladoure, Toulouse, 1057 pp.

Hayes, W. P.
1938-39. A bibliography of keys for the identification of immature insects, Part I Diptera. Ent. News, 49: 246-251; 50: 5-10 and 76-82.

Hanson, B. H.
1939. Die raupen der europäischen arten von Notodonta Ochs. (Lep.), Entom. Tidskrift, 60: 133-142.

Hennig, W.
1938. Ubersicht über die larven der wichtigsten deutschen Chrysomelinen. Arbeit über Phys. und Angew. Entom., 5:85-136.

Johannsen, O. A.
1934, 1935, 1937. Aquatic Diptera. Part I, II and III. Cornell Univ. Agric. Exp. Sta., Memoirs 164, pp. 1-71; 177, pp. 1-62; and 205, pp. 1-84.

Karny, H. H.
1934. Biologie der Wasserinsekten. F. Wagner, Wien, 31 pp.

Killington, F. J.
1936-1937. A monograph of British Neuroptera. Ray Society, London. Vol. 1, series 122, 1936 and Vol. II, series 123, 1937.

Leeson, H. S.
1939. Keys to the known larvae and adults of West African anopheline mosquitoes. Bul. Ent. Res., 30: 129-161.

MacGillivray, A. D.
1903. Aquatic Chrysomelidae and a table of coleopterous larvae. N. Y. State Mus., Bul. 68. pp. 288-327.

Malloch, J. R.
1927. A preliminary classification of Diptera, exclusive of puparia, based upon larval and pupal characters, with key to imagoes in certain families. Part I Bul. III. State Lab. Nat. Hist., 12: 161-407.

Metcalf, C. L. and Flint, W. P.
1939. Destructive and useful insects, 2nd Edition. McGraw-Hill Co., New York. 981 pp.

Milne, M. J.
1939. Key to North American caddis larvae. Psyche 46: 11.

Mitis, H. von.
1937. Ökologie und larvenentwicklung der Mittel-europäischen Gerris-arten (Heteroptera). Zool. Jahrb. (Syst.), 69: 337-372.

Needham, J. G. and Heywood, H. B.
(1929) A handbook of the dragonflies of North America. Thomas Co., Springfield, Ill. 378 pp.

Needham, J. G., Traver, J. R. and Tsu, Y.
1935. The biology of mayflies with a systematic account of North American species. Comstock Publishing Co., Ithaca, N. Y. 759 pp.

Needham, P. R.
1938. Trout streams, conditions that determine their productivity and suggestions for stream and lake management. Comstock Pub. Co., Ithaca, N. Y. 233 pp.

Nevin, P. R.
1929a. A study of the larva of **Calopteryx (Agrion) maculata.** Trans. Amer. Ent. Soc., 55: 425-427.
———1929b. Larval development of **Sympetrum vincinum** (Odonata:Libellulidae) Trans. Amer. Ent. Soc., 55: 79-102.

Owen, W. B.
1937. The mosquitoes of Minnesota, with special reference to their biologies. Minn. Agr. Exp. Sta., Tech. Bul. 126: 1-75.

Park, O., Allee, W. C. and Shelford, V. E.
1939. A laboratory guide to animal ecology and taxonomy. Univ. Chicago Press, Chicago. 272 pp.

Patterson, N. F.
1931. The bionomics and comparative morphology of the early stages of certain Chrysomelidae (Coleoptera, Phytophaga). Proc. Zool. Soc. London 1931, pp. 879-949.

Peterson, A.
1939. Keys to the orders of immature stages (exclusive of eggs and pronymphs) of North American insects. Ann Ent. Soc. Amer., 32: 267-278.

Ritcher, P. O.
1933. The external morphology of larval Bremidae and a key to certain species (Hymenoptera). Ann. Ent. Soc. Amer., 26: 53-63.
———1938. A field key to Kentucky white grubs. Jour. Kans. Ent. Soc., 11: 24-27.
———1940. Kentucky White Grubs. Ky. Agr. Exp. Sta., Bul. 401, pp. 73-155.

Riley, W. A. and Johannsen, O. A.
1932. Medical entomology, a survey of insects and allied forms which affect the health of man and animals. Ist ed. McGraw-Hill Co., N. Y. 476 pp.

Rymer-Roberts, A. W.
1930. A key to the principal families of Coleoptera in the larval stage. Bul. Ent. Research, 21: 57-72.

———1939. On the taxonomy of Erotylidae (Coleoptera) with special reference to morphological characters of the larvae. Trans. R. Ent. Soc. Lond., 88: 89-118.

Saalas, U.
1923. Die Fichtenkäfer Finnland. II Specieller Tiel 2 und larvenbestimmungstabelle. Ann. Acad. Scient. Fennicae, Ser. A. Tome XXII No. 1. Helsinki. 746 pp.

Schmidt, E.
1936. Die europäischen Leucorrhinialarven, analytisch betrachtet (Ordung Odonata) Arch f. Naturges. neue folge, Band 5. pp. 287-295.

Shotwell, R. L.
1930. A study of the lesser migatory grasshopper. U. S. D. A. Tech. Bul. 190, 34 pp.

Thienemann, A.
1937. Artische chironomidenlarven und puppen aus dem Zoologischen Museum, Oslo. Norsk. Ent. Tidssk., 5: 1-7, 1937.

Townsend, L. H.
1935. Key to larvae of certain families and genera of nearctic Neuroptera. Proc. Ent. Soc. Wash., 37: 25-30.

Traver, J. R.
1931. Some new southern species of the mayfly genus Hexagenia, with notes of the genus. Ann. Ent. Soc. Amer., 24: 591-619.

———1932-1933. Mayflies of North Carolina, Jour. Elisha Mitchell. Sci. Soc., 47: 85-236 and 48: 141-206.

———1933. Heptagine mayflies of North America. Jour. N. Y. Ent. Soc., 41:105-125.

Van Emden, F.
1938. On the taxonomy of Rhynchophora larvae (Coleoptera) Trans. R. Ent. Soc. Lond., 87: 1-37.

Voris, R.
1939a. Immature staphylinids of the genus Quedius. (Coleoptera:Staphylinidae) Ent. News, 50: 151-155 and 188-190.

———1939b. The immature stages of the genera Ontholestes, Creophilus and Staphylinus (Staphylinidae, Coleoptera) Ann. Ent. Soc. Amer., 32: 288-300.

Walker, E. M.
1933. The nymphs of the Canadian species of Ophiogomphus. Can. Ent., 65: 217-229.

Wells, R. W. and Knipling, E. F.
1938. A report on some recent studies on species of Gasterophilus occurring in horses in the United States. Iowa Journ. Sci., 12: 181-203.

Whelan, D. B.
1935. A key to the Nebraska cutworms and armyworms that attack corn. Nebr. Agr. Exp. Sta., Research Bul. 81, pp. 1-27.

Yuasa, H.
1922. A classification of the larvae of Tenthredinoidea. Ill. Biol. Monog., Bul. 7, 168 pp.

FIELD INFESTATION OF WHEAT BY INSECTS ATTACKING IT IN FARM STORAGE

R. T. Cotton and T. F. Winburn
Bureau of Entomology and Plant Quarantine

Reports that insect infestation in farm-stored wheat in the Missouri, Mississippi, and Ohio valleys is the most severe in 20 years have caused considerable speculation as to the extent to which this infestation originated in the field before the wheat was harvested. The fact that infestation of grain in the field is common in the southern states and that winters for the past few years have been mild and conducive to the wintering over of stored-grain pests at points farther north than usual gave credence to the supposition that field infestation may be of some importance in this region.

Examination of corn in the field, in the fall of 1938, showed some infestation of the rice weevil **(Sitophilus oryza)** (L)) present in Kansas, Oklahoma, Missouri, and Illinois. This insect is not resistant to low temperatures, and infestations of it in corn, in Kansas and Missouri, that were examined in November were found to have been killed by the cold. The custom of storing the corn in slatted cribs exposed to the cold probably prevents wintering over of the rice weevil in corn in these States.

Field infestation of corn by the Angoumois grain moth **Sitotroga cerealella)** (Oliv.)) also occurred to some extent in Kansas, Missouri, Illinois, and Oklahoma in the fall of 1938 and a certain percentage survived the mild winter following. This infestation increased during the summer of 1939, and caused considerable damage to the unshelled corn in the southern portions of these States.

During May and early in June in 1939, an attempt was made to obtain information regarding the extent of infestation of wheat in the field in Texas, Oklahoma, Kansas and Missouri, by insects classed as pests of stored grain. Quart jars were filled with wheat heads clipped from wheat fields in many parts of the wheat-growing region of these four states. These samples of wheat heads were held for several months for the possible emergence of insects. They were examined in September and October and a record made of all insects found in the jars with the wheat. Data regarding the insects reared from these samples are included in Table 1.

From the date of Table 1 it may be noted that the preponderance of insects reared from the wheat heads were scavengers. These are common in the fields and breed in many types of decaying vegetable matter. The samples were taken when the grain was not quite mature and had a high moisture content. Grain stored in this condition is very favorable for the development of this class of insects. The two most abundant forms, the foreign grain beetle (Ahasverus

TABLE 1.—Insects reared from heads of wheat collected in the field before harvest, 1938.

Species	Order	Family	Number of samples infested	Distribution	Remarks
Sitotroga cerealella (Oliv.)	Lepidoptera	Gelechiidae	2	Texas, Mo.	The Angoumois grain moth.
Stilbus apicalis (Melsh.)	Coleoptera	Phalacridae	1	Texas	The larvae of this species live in the heads of flowers.
Carcinops 14-striata (Steph.)	do.	Histeridae	1	Kansas	This insect is predaceous on grain insects and a scavenger. Cospolitian in distribution.
Cryptorhopalum ruficorne Lec.	do.	Dermestidae	1	Texas	Probably a scavenger not previously recorded from grain.
Anthrenus verbasci (L.)	do.	do.	1	Okla.	Mainly a scavenger. Cosmopolitan. Often found in grain, seed, etc.
Trogoderma versicolor (Creutz.)	do.	do.	3	Kansas, Texas, Mo.	A cosmopolitan feeder on grain and grain products.
Trogoderma sp.	do.	do.	5	Mo., Kans., Texas	These specimens may be T. versicolor.
Ahasverus advena (Waltl)	do.	Cucujidae	27	Texas, Kansas, Mo., Okla.	The foreign grain beetle. A very common pest in the field in this region. Abundant on field corn and grain that is out of condition. Cosmopolitan.
Laemophloeus minutus (Oliv.)	do.	do.	1	Kansas	The flat grain beetle is not uncommon in the field in warm climates.

Table 1.—continued.

Species	Order	Family	Number of samples infested	Distribution	Remarks
Cryptophagus sp., possibly **dentatus** Hbst.	Coleoptera	Cryptophagidae	1	Kansas	C. **dentatus** has not been recorded from this country, although recorded from Europe, Madeira, and Japan breeding in granaries in flour and vegetable refuse.
Typhaea stercorea (L.)	do.	Mycetophagidae	20	Kansas Mo., Texas, Okla.	A common pest in the field in this region, with habits similar to those of the foreign grain beetle.
Cartodere argus Reit.	do.	Lathridiidae	1	Texas	Previously recorded from houses and museums breeding in dried vegetable material.
Corticaria serrata (Payk.)	do.	do.	1	Kansas	This species is probably a scavenger and breeds in decaying vegetable matter.
Melanophthalma americana Mann.	do.	do.	2	Okla. Kansas	Breeds in grain out of condition. A scavenger.
Melanophthalma longipennis Lec.	do.	do.	1	Kansas	Breeds in grain out of condition. A scavenger.
Alphitophagus bifasciatus (Say)	do.	Diaperinae	1	Kansas	The two-banded fungus beetle. A cosmopolitan pest of grain that is out of condition.
Brachytarsus sticticus (Boh.)	do.	Anthribidae	1	Mo.	Previously reported from the eastern part of the country, with similar habits.
Sitophilus oryza (L.)	do.	Curculionidae	1	Kansas	At the present time is not common in wheat fields in Kansas.

TABLE 2.—Insects reared from heads of wheat collected in fiield in Missouri and Kansas in 1939

Date of collection	Locality	Date Examined	Species and number	Remarks
			Phalacridae	
June 29	Carrolton, Mo.	Sept. 20	**Stilbus apicalis** (Melsh.) (1)	The larvae of the Phalacridae live principally in the heads of flowers.
June 27	Emporia, Kans.	Sept. 20	**Stilbus apicalis** (Melsh.) (1)	
June 27	Allen, Kans.	Sept. 20	**Phalacrus politus** Melsh. (1)	
June 23	Pierceville, Kans	Sept. 20	**Phalacrus politus** Melsh. (1)	
			Lathridiidae	
June 27	Junction City, Ks.	Sept. 20	**Melanophthalma distinguenda** Com. (3)	Breeds in dried vegetable matter, milled cereal, etc.
June 30	Lowemont, Kans	Sept. 20	**Melanophthalma distinguenda** Com. (4)	
June 30	Lowemont, Kans.	Sept. 20	**M. simplex** (Lec.) (2)	
June 29	Waverly, Mo.	Sept. 20	**M. simplex** (Lec.) (3)	
			Melyridae	The soft winged flower beetles are said to be predaceous.
June 26	Hamilton, Kans	Sept. 20	**Collops quadrimaculatus** (F.) (1)	
			Curculionidae	These three weevils may have been associated with the wheat heads bv accident
June 23	Dodge City, Kans.	Sept. 20	**Smicronyx caseyi** Blatch. (2)	
June 26	Lawrence, Kans.	Sept. 20	**Anthonomus albopilosus** Dtz. (1)	
Aug. 1	Wheeler, Kans.	Sept. 20	**Stictobaris cribrata** (Lec.) (1)	

advevna (Waltl.) and the hairy fungus beetle (**Typhaea stercorea** (L)) are also very common in cornfields, particularly on tips of ears where rotting of the kernels occurs. Of the true pests of stored grain, the rice weevil was reared from only one sample taken in Kansas and none from the other states. In Texas, adults of the rice weevil were noticed on the wheat heads in the field at the time of collection, but the number of samples taken were evidently too few to show infestation by this pest. The Angoumois grain moth was reared from wheat heads collected in Texas and Missouri. The occurrence of dermestid beetles in some of the samples may have represented contamination of the samples while in storage; however, dermestid beetles have been collected on wheat heads in the field.

A further study of field infestation of wheat was made in 1939. Samples of wheat heads were collected from uncut fields during June and July from western Missouri and from parts of Kansas.

In all, approximately 150 samples were collected, placed in tightly closed boxes, and held for emergence. Conditions apparently were ideal for field infestation of grain. The grain when collected was fully mature, and an unusual abundance of rain at harvest time resulted in the wheat being particularly susceptible to infestation. The samples were examined in the latter part of September. A record of the insects found with the grain at that time is given in Table 2.

It may be noted from the data of Table 2 that insects were found in only eleven of the samples taken. In no case was either the Angoumois grain moth or the rice weevil found, and in about half the samples in which insects were found these were not pests of grain and were probably associated with the wheat heads accidentally.

From the foregoing studies it would seem unlikely that the heavy infestation of farm-stored grain that is prevalent in this region this year could have begun in the field.

NEW RECORDS OF LEPIDOPTERA FOR SUMNER COUNTY, KANSAS

Phoebis sennae marcellina (Cramer). A single female was taken in Sumner County, Kansas on September 22, 1940 by Dr. J. R. Turner. This visitor had not been previously recorded from Sumner County.

Phoebis sennae marcellina f. pallida (Cockerell). A single female was taken in Sumner County, Kansas on September 22, 1940 by Mrs. Stallings. This is another new visitor to Sumner County, Kansas.

Strymon ontario (Edw.). Three specimens were taken in Sumner County, Kansas on June 15th, 1940 by Mr. and Mrs. H. E. Jenista. This species appears to be a new resident of Sumner County.

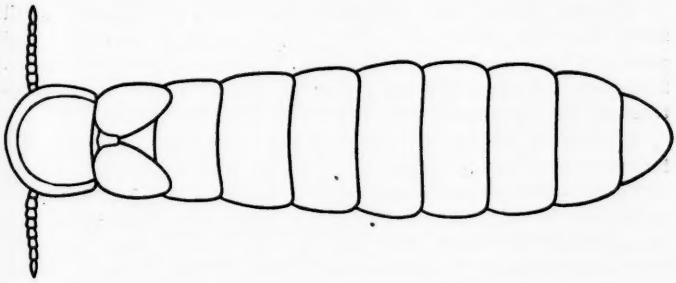
DON B. STALLINGS, Caldwell, Kansas

AN APTEROUS FEMALE PHOTINUS
(Coleoptera, Lampyridae)

John Wagener Green, Easton, Pa.

A small section of the genus Photinus, comprising **dimissus** Lec., **collustrans** Lec. and **granulatus** Fall, is characterized by the short and stout antennae and by the very large eyes of the male being closely approximate beneath, approaching the structures to be seen in Microphotus. A female example in the Kansas State College collection, thought to be **granulatus**, carries the analogy still further. It may be described as follows.

Body slender, claviform; pale reddish yellow above and beneath, antennae fuscous, pronotum with indefinite discal cloud wider in front, elytral disc and basal part of dorsal segments slightly darker. Antennae 11-jointed, short and compact, slightly fusiform, one-fourth longer than pronotum, joints 1, 3, 10 and 11 longer than wide, the others subquadrate. Front roughly sculptured, with three vague and shallow pits, one anterior and two within a tangent to the posterior margins of the eyes. Eyes rather small, separated by one and three-fourths times their width, very slightly closer beneath. Pronotum feebly transverse, broadly rounded in front, widest just before middle thence narrowed to base, hind angles narrowly rounded; disc irregularly granulate-punctate, median line depressed, sides explanate.



Elytra small, dehiscent, attaining basal fourth of first dorsal segment, not distinctly granulose. Abdomen with eight segments, surface irregularly and densely subgranulose, seventh dorsal with a narrow smooth median line on basal half.

Metasternum very short, its episterna terminating at one-half its lateral length. Lateral extension of posterior coxae bent obliquely forward to meet tip of episternum, broadly truncating the metasternal hind angles and affording a view of the sides of the usually concealed true first ventral segment. Darker median areas, apical on the sixth ventral and basal on the seventh (penultimate),

may indicate feeble light organs. These areas are not differently sculptured from the balance of the ventral surface. Legs normal. Length 6.5 mm.

Manhattan, Kansas, July 2, 1924, collected by D. Kenberry.

Photinus granulatus Fall, Bull. Brook. Ent. Soc., XXII, page 209, was described from two males taken at Lawrence, Kansas. Mr. Fall stated that the granulate pronotum is a unique character in our species so the probability is very great that the above described female is **granulatus.** I am indebted to Prof. George A. Dean, of Kansas State College, for the opportunity to study this specimen, as well as three Kansas males agreeing well with Fall's description.

TWO NEW SPECIES OF ERYTHRONEURA

R. H. Beamer, Lawrence, Kansas*

Erythroneura penapacha n. sp.
(Homoptera-Cicadellidae)

Erythroneura apacha Beamer (not Baker), Ann. Ent. Soc. Am., 1930, p. 431.

Resembling **apacha** Bk., but larger, color yellowish white, with very faint indication of oblique vitta on elytra, pygofer hooks long instead of short and broad, and aedeagus with two pairs of processes.

General ground color yellowish white. Vertex with a rather small sooty black spot either side middle, separated from each other and from eyes by more than their diameter. Pronotum somewhat fumose. Scutellum with black spot in each basal angle. Elytra with indications of lemon yellow, oblique vittae, tips slightly fumose.

Genitalia: Styles of the western type, foot small. Pygofer with two processes and a large seta; dorsal process shorter, almost straight, ventral process narrower and longer, curved sickle-shaped; aedeagus with shaft almost straight in dorsal view, with apical pair of lateral processes more than half as long as shaft, projecting away from shaft at about 45 degrees, and a pair of basal processes about as long as shaft and closely appressed to it.

Holotype male, allotype female, two male and three female paratypes, Brownsville, Texas, June 29, 1938, R. H. Beamer. One male paratype, Victoria, Texas, July 29, 1903.

Erythroneura biramosa n. sp.

Resembling **opulenta** externally, but color marks orange instead of red, base of foot of style forming almost a half circle and posterior point more than half as long as base.

Ground color of summer specimens yellowish white, markings

*Contribution from the Department of Entomology, University of Kansas.

orange. Vertex with one more or less round median spot. Pronotum usually with anchor-shaped mark, hooks of anchor along anterior margin. Elytra with dash along claval suture, half its length, a spot on outer third of clavus, a small spot on costa at base and an angular vittae arising on costa at anterior end of costal plaque, surrounding it and ending in cross-veins near middle of elytra, apical cells more or less suffused with darker.

Genitalia. Style with foot short, heel prominent, foot curved into almost half-circle; anterior point short, less than a right angle; posterior point more than half as long as base of foot, sharp; aedeagus of median size in dorsoventral view, widest at base, slightly longer than twice basal width; pygofer hook long and slender, reaching slightly beyond pygofer, curved out slightly at tip.

Holotype male, allotype female, and numerous male and female paratypes, Kenna, New Mexico, July 16, 1936, R. H. Beamer. Swept from dwarf oak.

Types deposited in Snow Entomological Collection.

ADDITIONAL NOTES ON GALGUPH LOBOPROSTETHIA SAILER
(Thyreocorinae)

R. I. Sailer, Lawrence, Kansas*

Through the kindness of Doctors R. C. Smith and R. H. Painter of Kansas State College, C. E. Mickel of the University of Minnesota, and H. H. Ross of the University of Illinois, I have been able to study considerable additional material of the species **G. loboprostethia** resulting in the following additional locality records which are worthy of mention: Olkwood, Ill., June 18, 1926, collected by Frisan and Hayes; Sioux City, Iowa, June 3, 1926, collected by C. N. Ainelie.

Professor H. G. Barber has recently further extended the bounderies of this species; he reports having received for determination a number of specimens collected in Hamilton County, Tenn., April 22, by W. F. Turner.

The following host records were obtained from a series of 43 specimens bearing Manhattan, Kansas, as a locality record, the majority having been collected by Doctors R. C. Smith and D. A. Wilbur of Kansas State College: 27 specimens taken on alfalfa, 1 on corn and another on yellow sweet clover, the remainder bearing no host records. Of the specimens taken on alfalfa, 23 were captured in July, 2 in May and 1 each in September and October.

*Contribution from the Department of Entomology, University of Kansas.

A NEW CORIXID FROM CHINA

H. B. Hungerford, Lawrence, Kansas*

For many years I have had a moderately large Corixid that has remained unnamed in our collection of Chinese Corixidae. It is certainly distinct from any of the species that have been described or redescribed in recent years.

Sigara suensoni new species

Size: Length 7.8 to 8.2 mm.; width across the head 2.7 mm.

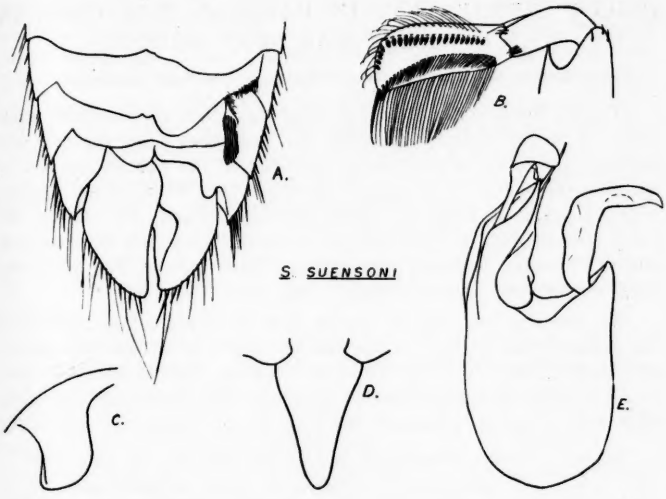
Color: General facies light to medium brown. Head, legs and venter yellowish. The pronotum crossed by eight or nine brown lines, the last five or six united at their ends by a marginal band. The dark lines usually a little broader than the yellow interspaces. The pale figures of the hemelytra slender, transverse, in wavy, broken lines. The line between corium and membrance faintly marked, the pattern figures crossing it usually without interruption.

Structural Characteristics: Head of male, when viewed from above, a little more than half the length of the pronotal disk, the frontal arch but slightly produced—alike in both sexes. Facial impression of the male slight. Interocular space about 5/6 of eye width in male, slightly wider in female. The post ocular space narrow, laterally, but rather broad at inner angle of the eyes due to the median projection of the hind margin of the head. The third antennal segment is to the fourth as 19:10. Only faint indication of median carina on anterior margin of pronotum. Dorsal surface of insect shiny, the pronotal disk and hemelytra faintly rugulose. Lateral lobe of prothorax quadrate and slightly oblique on distal end. Metaxyphus long and slender. Abdominal dorsum of male as shown in text figure, the strigil long and narrow; male genital capsule as shown in text figure. The oblique distal portion of the right clasper appears palaform on its inner surface when viewed from the front. The penis sheath expanded at the tip, as shown in the drawings.

The male pala of the typical Anticorixa shape with a row of about 24 pegs, which are smaller at the ends of the row. The anterior femur without stridular patch of pegs. The measurements of the middle leg as follows: Femur: tibia:tarsus: claws:: 100:38:33:38. The measurements of the hind leg: Femur:tibia:1st tarsal:2nd tarsal::57:55:68:20.

Described from four males and nineteen females labeled "Soochow, China, June 10, 1923. E. Suenson" and two females labeled "Soochow, China, April 29, 1923. E. Suenson." These last two are a little darker than those taken in June, which evidently are from a newly emerged brood, so that the typical color is probably medium

*Contribution from the Department of Entomology, University of Kansas.



instead of light brown. The holotype and allotype from the June 10 series. Types in Francis Huntington Snow Collection, University of Kansas.

Comparative Notes: This species has a male pala of same general shape as that of **Sigara linnae** (Fieb.). It is a little broader species than Fieber's species, does not have a rastrated surface, and the color pattern of hemelytra is much more broken. Its smaller size readily separates it from the large species of Sigara described from the region in recent years by Lundblad, Jaczewski, and myself.

NEW RECORDS OF BUTTERFLIES FOR KANSAS

Hemiargus cyna (Edw.) A single perfect male specimen of this butterfly was taken in Sumner County, Kansas on April 3rd, 1940. For the present this species can only be regarded as a visitor in Kansas; however, it has been this writer's observation that species first recorded in the spring or early summer are often later proven to be residents of that vicinity. Taken by the writer.

Megisto hermes f. sosybius (Fabr.) A single male specimen of this butterfly, slightly damaged, was taken in Sumner County, Kansas on October 3rd, 1940. There is little question but that this is merely a visitor to Kansas. Taken by Mrs. R. C. Turner, Jr.

DON B. STALLINGS, Caldwell, Kansas

INSECT INFESTATION IN RAILWAY BOX CARS IN WHICH WHEAT HAS BEEN SHIPPED

Temple F. Winburn, Bureau of Entomology and Plant Quarantine

During the summer of 1939 a study was made of the insect population of empty railway box cars that had been used for carrying grain as indicated by the insects removed in the routine process of cleaning the cars with a jet of compressed air. Visits were made to railroad yards at Atchison, Kans., and St. Joseph, Mo. during the early part of June before much of the grain crop had been carried, and to Atchison, Kansas., again in the latter part of July after the rush of the grain-carrying season was over.

In cleaning box cars a stream of compressed air is applied to the entire inside surface of the car by means of a hose and nozzle, particular attention being given to cleaning behind grain linings, in the corners, and along the cracks in the floor and sides. In many cars accumulations of grain, varying in size from a handfull to

Table 1.—Insect infestation of railway box cars in June 1939

Idenity of car	Type of grain lining	Number of species of insects found in material blown from cars
A. C. & Mo.	Single	3 Rice weevils **Sitophilus oryza** (L.)), dead.
		1 Black carpet beetle larva (**Attagenus piceus** (Oliv.)), alive.
		1 Small-eyed flour beetle (**Palorus ratzeburgi** (Wissm.)), alive.
A. Mo. 90494	do.	1 Small-eyed flour beetle, alive.
		Many book lice (**Liposcelis divinatorius** (Müll.)), alive.
		2 Cadella larvae (**Tenebroides mauritanicus** (L.)), alive.
C. B. & Q.	Double	3 Confused flour beetles (**Tribolium confusum** J. duV.), alive.
		3 Confused flour beetle larvae, alive.
		1 Rice weevil, dead.
West'n Pac. 17751	Single	1 Black carpet beetle adult, alive.
C. B. & Q. 120262	Double	1 Flat grain beetle (**Laemophloeus minutus** (Oliv.)), alive.
C. B. & Q. 105254	do.	No insects found.
C. B. & Q. 113548	do.	No insects found.
C. B. & Q. 110722	Single	No insects found.
C. B. & Q.	do.	2 Granary weevils (**Sitophilus granarius** (L.)), dead.
		1 Small-eyed flour beetle, alive.
		4 **Cryptophagus dentatus** Hbst., alive
C. B. & Q. 11645	do.	No insects found.
Seab'd Airl'e 17926	do.	No insects found.
C. B. & Q. 116140	do.	2 Confused flour beetle larvae, alive.
C. B. & Q. 130873	do.	1 Confused flour beetle larva, alive.
C. B. & Q. 111913	Double	No insects found.

several pounds, are found behind the grain lining, and blowing with air must be supplemented by beating on the lining to jar the grain loose. At the end of the cars, where there is no opening in the lining at the floor level, holes are either bored in the lining or, if possible, a section or two is removed to allow for the insertion of the air nozzle and blowing out the grain. The cleanings removed from the cars usually consisted of grain, dust, and insects. A careful examination was made of all material removed from each car and any insects found were taken to the labortory for identification.

In the early part of June, 14 cars that had been used to carry grain were taken at random and cleanings from them examined. The number and species of insects found in each car are recorded in Table 1.

As shown by the data of Table 1, 8 of the 14 cars examined contained some insects. Nine different species of insects were represented in the collection but in no case were the numbers large. This would appear to represent the condition of the average grain-carrying car before the main grain-shipping season.

Examination at Atchison, Kans., late in July of 24 box cars that had been actively engaged in crrying grain prsented a rather different picture. Data regarding the insect infestation found in these cars are given in Table 2.

Table 2.—Insect infestation of railway box cars in July, 1939

Idenity of car	Type of grain lining	Number of species of insects found in material blown from cars
M. P. 42645	Double	1 Rice weevil (**Sitophilus oryza** (L.)), dead.
M. P. 42155	Single	1 Cadelle larva (**Tenebroides mauritanicus** (L.)), alive.
M. P. 90096	do.	29 Sawtoothed grain beetles (**Oryzaephilus surinamensis** (L.)), alive 3 Small-eyed flour beetles, alive. 1 Small-eyed flour beetle, dead. 1 Small-eyed flour beetle larva (**Palorus ratzeburgi** (Wissm.)), alive. 9 Flat grain beetles (**Laemophleous minutus** (Oliv.)), alive.
M. P. 41236	do.	1 Cadelle adult, alive. 1 Cadelle adult, dead. 2 Cadelle larvae, alive. 2 Black carpet beetle larvae (**Attagenus piceus** (Oliv.)), alive. 1 Confused flour beetle (**Tribolium confusum** J. du V.), dead. 1 Small-eyed flour beetle, dead.
M. P. 48217	do.	4 Confused flour beetles, alive. 2 Confused flour beetles, dead.

Table 2—continued

Idenity of car	Type of grain lining	Number of species of insects found in material blown from cars
		37 Confused flour beetle larvae, alive.
		8 Cadelle larvae, alive.
		6 Flat grain beetles, alive.
		Numerous book lice (**Liposcelis divinatorius** (Müll.)), alive.
N. Y. Cent. 151688	Single	1 Flat grain beetle, dead.
		1 Black carpet beetle larva, alive.
		1 Larger cabinet beetle (**Trogoderma versicolor** (Creutz.)), alive.
Norf'k & Sou. 25241	do.	1 Rice weevil, dead.
C. B. & Q. 15380	do.	2 Confused flour beetles, dead.
C. B. & Q. 109429	Double	2 Sawtoothed grain beetles, alive.
		1 Flat grain beetle, alive.
		1 Rice weevil, dead.
C. B. & Q. 99927	Double	2 Confused flour beetles, alive.
		2 Confused flour beetles, dead.
		5 Small-eyed flour beetles, alive.
		1 Small-eyed flour beetle larva, alive.
		1 Granary weevil (**Sitophilus granarius** (L.)), alive.
		1 Cadelle beetle, alive.
		1 Cadelle larva, alive.
		4 Black carpet beetle larvae, alive.
Frisco 127668	Single	1 Cadelle larva, alive.
		1 Small-eyed flour beetle, alive.
U. P. 182142	do.	4 Granary weevils, alive.
Southern 10796	do.	1 Sawtoothed grain beetle, alive.
C. B. & Q. 119997	Double	1 Cadelle adult, dead.
C. B. & Q. 130814	do.	1 Flat grain beetle, alive.
C. B. & Q. 112633	do.	2 Black carpet beetle larvae, alive.
C. B. & Q. 100049	do.	6 Confused flour beetles, alive.
C. B. & Q. 109365	do.	1 Two-banded fungus beetle (**Alphitophagus bifasciatus** (Say)), alive.
		4 Cadelle larvae, alive.
		130 Dark mealworm larvae, (**Tenebrio obscurus** F.), alive.
		12 Dark mealworm larvae, dead.
		6 Lesser mealworm larvae (**Alphitobius diaperinus** (Panz.)), alive.
		1 Cadelle adult, alive.
		1 Cadelle adult, dead.
		12 Flat grain beetles, alive.
North'n Pac. 13766	do.	1 Rice weevil, dead.
C. B. & Q. 103474	Double	1 Confused flour beetle, alive.
C. B. & Q. 114597	do.	1 Rice weevil, alive.
		19 Black carpet beetle larvae, alive.
So. Pac. 29360	Single	5 Small-eyed flour beetles, alive.
		2 Small-eyed flour beetles, dead.
		2 Cadelle larvae, dead.
		6 Hairy fungus beetles (**Typhaea stercorea** (L.)), alive.
Ill. Cent. 157985	do.	No insects found.
C. B. & Q. 119819	Double	No insects found.

As can be seen from the data of Table 2, of the 24 cars examined only 2 were without a visible supply of insects. Fourteen different species of insects were represented, in some cases as many as five different species in the same car. The number of insects per car was in many cases high, as many as 153 being found in a single car.

It is evident that in the early part of the season before extensive shipments of grain are made, about 50 percent of grain-carrying cars are likely to carry a light infestation of insects, but after the rush of the grain-carrying season, a majority of the cars are heavily infested with insects.

THE ALFALFA PLANT BUG, ADELPHOCORIS LINEOLATUS (GOEZE), FOUND IN KANSAS

Charles Curtiss, Kansas State College

While taking insect sweepings in an alfalfa field on the Kansas State College agronomy farm at Manhattan, Kansas, during the third week of August, 1939, the writer discovered in his net several large pale Mirids of a species which he had not previously collected. It was suspected that they were **Adelphocoris lineolatus** (Goeze), first reported in the United States by Knight (1930a), at Ames Iowa.

Several specimens were taken for pinning, but were accidentally lost. Later efforts to replace them by sweeping alfalfa were unsuccessful. A single specimen was found, however, among a group of insects swept from alfalfa at Manhattan, August 22, 1939, by Donald Yost, a student in the Kansas State College entomology deprtment. This specimen was sent for determination to Dr. H. H. Knight of Iowa State College, who identified it as **Adelphocoris lineolatus** (Goeze).

This is the first record of the insect in Kansas. It is a native of Europe, and until 1929 was known in North America only from Cape Breton Island, Nova Scotia, where it was recorded by Knight (1922). In June, 1929, Knight (1930a, 1930b) found it in a limited area surrounding Ames, Iowa. He proposed the common name "alfalfa plant bug" for **A. lineolatus**, as the majority of specimens taken were swept from alfalfa or sweet clover, (Knight, 1930b).

If this species becomes common in alfalfa and clover fields in Kansas, as seems entirely probable, it may well become a real pest. Its injury to alfalfa has been noted repeatedly by Russian workers. Zolotarevsky (1915) stated that great damage to alfalfa resulted from infestations of **A. lineolatus**. Injury of 10 per cent of the flower buds of first year alfalfa grown for seed was reported by Ponomarenko (1935). It is known that the closely related New World species, **A. rapidus** (Say), which occurs through most of the

United States, and **A. superbus** (Uhl.) a western species, are factors in reducing alfalfa seed production.

Other favored food plants of **A. lineolatus** were indicated by Golledge (1915), who mentioned chrysanthemums, onions, and beets, as well as alfalfa. He even referred to the species as the "chrysanthemum bug." Vasiliv (1924) listed it among insects injurious to cotton in Russia.

It is desirable that collectors in Kansas and adjoining states be on the alert for specimens of **A. lineolatus**, so that an up-to-date record of its spread from Ames, Iowa, the apparent point of introduction in the United States, may be maintained.

The alfalfa plant bug is very similar in general form to the rapid plant bug, **A. rapidus**, but is slightly larger than that species, and is much paler, the pre-dominant color being yellowish-green. Those familiar with the rapid plant bug will have little difficulty in recognizing **lineolatus** on the basis of these general points of similarity and difference. Knight (1930a, 1930b) gave good general descriptions of the male, female, and fifth instar of **A. lineolatus.**

LITERATURE CITED

Golledge, C. J.*
The insects injurious to chrysanthemums in Britain. Jour. North of England Hort. Soc. Leeds. Nos. 53-54, August-September, 1915. pp. 205-216. (From Rev. Appl. Ent. Ser. A. 3: 746-47. 1915).

Knight, Harry H.
Nearctic records for species of Miridae known heretofore only from the Palearctic region (Heterop.). Can. Ent. 53: 280-88. 1922.

———An European plant-bug (**Adelphocoris lineolatus** Goeze) found in Iowa (Hemip.: Miridae). Ent. News 41: 4-6. Jan., 1930a.

———"Alfalfa plant bug," a common name for an introduced European bug. . . Jour. Econ. Ent. 23: 331-34. April, 1930b.

Ponomarenko, D. A.*
Entomological factors that lower the seed production of lucerne. (In Russian). Plant Prot. 1935. Fasc. 3, pp. 109-10. Leningrad, 1935. (From Rev. Appl. Ent. Ser. A. 23: 616. 1935.).

Vasiliv, I. V.*
Cotton pests. (In Russian). Cotton Indust. iii, no. 7-8. pp. 86-116. Moscow. July-August, 1924. (From Rev. Appl. Ent. Ser. A. 12: 555-56. 1924.)

Zolotarevsky, B. N.*
Preliminary report on the work in entomology in 1914. (In Russian). Stavropol. Stavropol—Caucasian Agr. Exp. Sta. of the Stavropol Municipal Authority. 1915. (From Rev. Appl. Ent. Ser. A. 3: 479-80. 1915).

*Original not seen.

A FREAK BUTTERFLY

On October 5th, 1940 in Sumner County, Kansas a freak butterfly was captured by John Huen.

Both hind wings of this butterfly and the left forewing are typical of a female **Colias eurytheme f. amphidusa ab. alba** (Stkr.) being greenish white with the usual black markings. The right forewing is typical of a male **Colias eurytheme f. amphidusa** (Bdv.) being a bright orange yellow with the usual black markings.

DON B. STALLINGS, Caldwell, Kansas

THE ROBBER FLIES OF COLORADO (Diptera, Asilidae)*

Maurice T. James, Colorado State College

The present paper represents the results of the work of the past ten years on this interesting family of Diptera as it occurs in Colorado. The study is made primarily from the zoogeographical, rather than from the systematic standpoint; but the citations of the most recently published key, review, or monographic treatment of each genus, the inclusion of a key to the Colorado genera and species whenever (with one exception) no adequate one exists, and the citation of the original description of each species, should enable the student who has access to ordinary entomological literature to make determinations. Foundation works, other than those cited, which will aid considerably in making determinations, but which can not as a rule be used without supplement, are those of Back (1909), Bromley (1934), and Hine (1909, 1911, and 1919).

Some published records of Colorado Asilidae have been gleaned from the literature, the most important papers, in addition to the Back and Hine works above cited, being those of Tucker (1907 and 1908), Cockerell (1917) and Brown (1929). Certain records of these workers have not been used, however, because of the fact that in some genera early determinations are not always reliable.

The material used in this study came chiefly from the following sources: (1) The collection of the University of Colorado. This includes earlier material accumulated by Dr. Cockerell and others; the collections obtained in the expedition of Mr. H. G. Rodeck and the writer through the eastern and southeastern counties of Colorado in July and August, 1933; the collection of Mr. Urless Lanham and Mr. Robert Bauer in west-central Colorado in 1938; the collections of Mr. H. G. Rodeck and Mr. Urless Lanham at Science Lodge, near Ward; the collections of Mrs. Helen B. Rodeck in the Rocky Mountain National Park; and others. (2) The collection of the Colorado State College. This includes earlier material accumulated by Dr. C. P. Gillette, Dr. C. R. Jones, and others; the material collected by the writer and his wife, particularly in Weld, Boulder, Larimer, and Crowley counties; the collections of the James and Lanham expedition to central and south-central Colorado in July, 1938; and others. (3) The important collections made by Rev Father Bernard Rotger, particularly in the southwestern counties of the State.

I am indebted to all who have so generously collected for me and lent me material; also to Dr. S. W. Bromley for some determina-

*Condensed from the systematic part of a thesis submitted in June, 1938, to the Graduate School of the University of Colorado, in partial satisfaction of the degree of Doctor of Philosophy, and brought up to date by the addition of information since accumulated.

tions in the genera **Stenopogon, Diogmites, Mallophorina,** and **Asilus,** and to Dr. Joseph Wilcox for determinations in the genera **Cyrtopogon** and **Lasiopogon.** Most of the determinations, with both the credit and blame attached thereto, are my own; this is true of the Rotger collection, although some of the data used in this paper are from determinations made by Dr. Bromley and relayed to me by Father Rotger.

KEY TO THE GENERA*

1. Marginal cell open ---------- 2
   Marginal cell closed and petiolate ---------- 3
2. Antennae with a slender terminal arista; palpi one-segmented; alula lacking; very slender species (Leptogastrinae) ---------- LEPTOGASTER
   Antennae without a slender terminal arista, frequently with a style; palpi two-segmented; alula present (Lasypogoninae) ---------- 4
3. Antennae with a slender terminal arista; usually elongated species (Asilinae) ---------- 27
   Antennae without a terminal arista, sometimes with a style; usually more robust species (Laphriinae) ---------- 35
4. Claws long, slender, without pulvilli ---------- 5
   Claws shorter, with evident pulvilli ---------- 6
5. Mystax confined to the oral margin ---------- HODOPHYLAX
   Mystax extending onto the face ---------- ABLAUTUS
6. Anterior tibia terminating in a sharp, curved, ventral spur ---- 7
   Anterior tibiae with only straight or gently curved apical bristles ---------- 12
7. Middle of mesonotum raised and bearing a crest of long, dense hairs ---------- COMANTELLA
   Mesonotum never with a crest of dense hair ---------- 8
8. Face bare, with bristles on the oral margin, in profile straight or gently concave, the oral margin most prominent. 9
   Face convex below, more or less covered with hairs, the oral margin not the most prominent ---------- 10
9. Fourth posterior cell closed and petiolate at the apex; antenna without a distinct style ---------- DIOGMITES
   Fourth posterior cell open or closed in the margin; antenna with a distinct style ---------- SAROPOGON
10. Third antennal segment more or less dilated, the style very short ---------- LESTOMYIA
    Third segment slender, elongate ---------- 11

*In constructing the following key I have made free use of those of Curran's **North American Diptera** and Bromley's **Asilidae of Texas.** Both these works will be found useful supplements.

11. Scutellum without bristles or hair ---------- COPHURA
Scutellum with marginal bristles ---------- BUCKELLIA

12. Head slightly higher than broad; face narrow above, swollen and broadened below ---------- 13
Head obviously broader than high ---------- 14

13. Antenna with a terminal style ---------- STENOPOGON
Antenna without a visible style ---------- OSPRIOCERUS

14. Fourth posterior cell closed ---------- 15
Fourth posterior cell open, rarely almost closed ---------- 17

15. Face hairy above the mystax; medium sized flies ---------- 16
Face bare except along the oral margin; very large flies ---------- MICROSTYLUM

16. Antenna with a short, broad, easily distinguishable, two-segmented style ---------- LAPHYSTIA
Antenna without a distinct style ---------- PSILOCURUS

17. Antennal style as broad as the third antennal segment and simulating a segment, sometimes closely appressed and not easily differentiated ---------- 18
Antennal style narrower than the third segment or absent ---19

18. Nearly bare species; abdomen narrow and cylindrical; lateral slopes of the metanotum bare ---------- DIOCTRIA
More pilose species; abdomen short; lateral slopes of the metanotum pilose ---------- DICOLONUS

19. Face bare, except on the oral margin ---------- STICHOPOGON
Face with hair between the mystax and oral margin, or evenly haired ---------- 20

20. Mesonotum with the dorsocentral bristles strong and extending in front of the suture; if rather weak anteriorly, there are no acrostical hairs ---------- 21
Dorsocentrals absent or not strongly differentiated; mesonotum hairy, the acrostical hair always present ---------- 23

21. Acrostical hairs present, usually abundant but short ---------- LASIOPOGON
No acrostical hairs ---------- 22

22. Mystax composed of a few very stout, scattered bristles ---------- COLEOMYIA
Mystax composed of more numerous, ordinary bristles ---------- METAPOGON

23. Mesonotum with the hair appressed and with distinct subappressed dorsocentrals posteriorly; middle tibiae ending in a straight spur ---------- WILCOXIA
Mesonotal hairs erect, the bristles, if any, fine and erect ------24

24. Face decidedly gibbous, the swelling clearly limited above ----25
Face flat or evenly, gently convex ---------- 26

25. The third vein branches before the apex of the discal cell; style about half as long as the third segment ---------- EUCYRTOPOGON
The third vein branches conspicuously beyond the apex of the discal cell; style one-fourth or less the length of the third segment ---------- CYRTOPOGON

26. Posterior tibiae swollen, about twice as large as the anterior ones ---------- HOLOPOGON
Posterior tibiae not enlarged ---------- HETEROPOGON

27. The posterior branch of the third vein meets the costa beyond the apex of the wing ---------- 28
The posterior branch of the third vein meets the costa before the apex of the wing ---------- 34

28. Slopes or lateral swellings of the metanotum pilose ---------- 29
Slopes of lateral swellings of the metanotum without pile ---- 30

29. Ovipositor of the female without apical spines; male genitalia compact, never leaving a large open space from the dorsal view ---------- ASILUS
Ovipositor of the female armed at apex with six stout, short spines; forceps of male genitalia strongly curved and leaving a large open space on the apical half PHILONICUS

30. Claws acute apically; abdomen elongated ---------- 31
Claws blunt, obtuse apically; abdomen short, thick, hairy ---- 33

31. Three submarginal cells, the second and third divided by a cross-vein which is situated well beyond the apex of the discal cell ---------- PROMACHUS
Two submarginal cells; in rare instances (some Erax) three, but in such cases, the cross-vein separating the second and third is well before the apex of the discal cell--- 32

32. Face only weakly gibbous; ovipositor ending in a circlet of spines ---------- PROCTACANTHELLA
Face with a strong gibbosity occupying the lower half or more; ovipositor not ending in a circlet of spines ---- ERAX

33. Face evenly, gently convex, evenly pilose, the oral margin with bristles ---------- MALLOPHORINA
Face more or less strongly gibbous below, not uniformly pilose ---------- MALLOPHORA

34. Ovipositor of the female cylindrical, ending in a circlet of spines; abdomen of male longer than the wings; second submarginal cell never angulate or with a spur at its base ---------- PROCTACANTHUS
Ovipositor of the female without spines, rarely cylindrical; abdomen of male frequently shorter than the wings; second submarginal cell usually angulate, often with a spur at the base ---------- ERAX

35. Wings with three submarginal cells ----------POGONOSOMA
Wings with only two submarginal cells ----------36

36. Third antennal segment with a short blunt apical style, See **Laphystia.** Two species of **Asilus** may also run. here.
Third antennal segment without a style ----------37

37. Veins at distal end of discal and fourth posterior cells parallel or continuous in the same straight line; body punctulate; first antennal segment not more than twice as long as the second ----------ATOMOSIA
Veins at distal end of the discal and fourth posterior cells very distinctly angulated and not parallel ----------38

38. Proboscis slightly pointed and upturned in profile at tip; palpi broadened and truncate at tip -------ANDRENOSOMA
Proboscis truncate, long; palpi slender and rounded at tip ----39

39. Bare species; hind femora usually with tubercles below; tips of antennae slightly curved ----------LAMPRIA
Usually more pilose species (exception, **Laphria felis**); antennae straight ----------40

40. Densely pilose species; abdomen short and broad, generally broader beyond the middle ----------BOMBOMIMA
Less pilose, the hairs short; abdomen more cylindrical LAPHRIA

LEPTOGASTER Meigen

Key to Species found in Colorado

1. Antennae wholly yellow; hind femora each with a conspicuous patch of white pile below---------- **hirtipes**
At least the first and third antennal segments black; hind femora without a conspicious patch of white pile below ---------- 2

2. Antennae wholly black ---------- 3
Second antennal segment red ---------- 4

3. Middle and hind femora, hind tibiae, and usually middle tibiae conspicuously marked with black, or blackish; occipital bristles pale ----------**arenicola**
Only the hind femora and tibiae with black markings; upper occipital bristles black (Nebraska; may occur in Colorado) ----------**murinus**

4. Legs yellow or reddish ----------**coloradensis**
All femora and tibiae with conspicuous black markings ----------**eudicranus**

1. **Leptogaster hirtipes** Coquillett, 1904. Proc. Ent. Soc. Wash., 6:178. Recorded from Colorado by Back. Poncha Pass, Colo., Aug. 3, 1938 (James and Lanham); Lake City, Aug. 8 to 21, 1938 (C. L. Fluke).

2. **Leptogaster arenicola** James, 1937, Ent. News, 48:13. The original name **arenicolus** is an error; **arenicola** is a noun in apposition, not an adjective. Eads (holotype); Fort Collins. July and August.

3. **Leptogaster coloradensis** James, 1937. Ent. News, 48: 14. Holotype from Boulder. Hamilton; Ft. Collins. Common in the College pasture near Ft. Collins in June and early July; its place is taken in July by **L. arenicola.**

4. **Leptogaster eudicranus** Loew, 1874, Berl. Ent. Zeit., 18: 353. Boulder; Ft. Collins; Hamilton. July.

HODOPHYLAX James.

Pritchard, 1938, Pan-Pac. Ent., 14: 129-131*

5. **Hodophylax aridus** James, 1933, Amer. Mus. Nov., 596, p. 2. Holotype from Crowley; recorded by James from Boone.

ABLAUTUS Loew.

Wilcox, 1935, Canad. Ent., 67: 222-227.

6. **Ablautus mimus** Osten Sacken, 1877, West. Dipt., 290. Denver, March 12, 1902 (S. A. Johnson); Durango, May 10, 1937 (Rotger); Arboles, May 10, 1937 and June 26, 1937 (Rotger); Tiffany, May 10, 1937 (Rotger).

COMANTELLA Curran

James, 1937, Pan-Pac. Ent., 13: 61-63.

7. **Comantella rotgeri** James, 1937. Pan-Pac. Ent., 13: 61. Holotypes from Stollsteimer (Francis). Recorded by James from Arboles., Pagosa Junction, Durango, and Tiffany. Ignacio. Mar., Apr., Oct., Nov.

8. **Comantella fallei** (Back), 1909, Trans. Amer. Ent. Soc., 35: 378. Holotype from Ft. Collins. Recorded by James from Denver; Colorado Springs; Kirk. Mar., Apr., and Oct.

DIOGMITES Loew.

Bromley, 1936, Jour. N. Y. Ent. Soc., 44: 225-237.

9. **Diogmites neoternatus** (Bromley), 1931, Ann. Ent. Soc. Amer., 24: 432. Recorded by Back from Rocky Ford (as **ternatus**) Olney Springs, July 16, 1927 (M. T. James); Las Animas, July 12, 1931 and Aug. 6, 1931 (Leonard Sweetman).

10. **Diogmites coloradensis** (James), 1933, Amer. Mus., Nov., 596: 2 Boulder, Aug. 2 and 10, 1932 (type series); Pagosa Springs, Aug. 3, 1935 (Rotger); La Plata Co., June 16, 1934 (Rotger); Francis, July 8, 1935 (Rotger).

11. **Diogmites grossus** Bromley, 1936, Jour N. Y. Ent. Soc., 44: 236. Holotype from Lamar. Paratypes from White Rocks (near Boulder) and Wray. Paonia; Prowers; Eads; Masonville. Aug., Sept.

*Citations under the genus refer to the latest available key, review, or monograph. See page 27.

12. **Diogmites pulcher** (Back), 1909, Trans. Amer. Ent. Soc., 35: 361. Roggen, July 31, 1934 (James) and Aug. 29, 1930 (Rodeck).

13. **Diogmites angustipennis** Loew, 1866, Cent., VII, 41. Recorded by Cockerell from Boulder. Ft. Collins; Walker Hill, Crowley Co.; Lamport; Boone; Denver. Late July, Aug.

14. **Diogmites symmachus** Loew, 1872, Cent., X, 26. Boulder; White Rocks, near Boulder; Ft. Collins; Masonville; Lamport; Eads; Ordway; Huerfano Co. July to early Sept.

SAROPOGON Loew

Curran, 1931, Amer. Mus. Nov., 487, pp. 1-3.

15. **Saropogon combustus** Loew, 1874, Berl. Ent. Zeit., 18: 373. A dichromatous species; the male is black, the female, reddish yellow. Recorded from Ft. Collins by Back. Cheyenne Wells, July 27, 1933 (Rodeck and James); Las Animas, July 2 and 4, 1933 (Leonard Sweetman); Hygiene, Aug. 1, 1935 (Lanham).

LESTOMYIA Williston.

Curran, 1931, Amer. Mus. Nov. 487, pp. 3-4.

16. **Lestomyia sabulonum** (Osten Sacken), 1877, West. Dipt., p. 292. Maybell, June 17, 1907.

17. **Lestomyia strigipes** Curran, 1931, Amer. Mus. Nov., 487, p. 3. Seven miles South of Glade Park, July 23, 1938 (Lanham and Bauer).

COPHURA Osten Sacken

Curran, 1931, Amer. Mus. Nov., 487, pp. 4-10.

18. **Cophura lutzi** Curran, 1931, Amer. Mus. Nov., 487, p. 7. Holotype from "Regnier, Colorado." Regnier is in the Oklahoma panhandle, just over the Colorado line. The type specimen may have been taken on the Colorado side.

19. **Cophura clausa** (Coquillett), 1893, Canad. Ent., 25: 34. Durango, June 5 and 9, 1936 (Rotger); det. Bromley.

BUCKELLIA Curran

Curran, 1931, Amer. Mus. Nov., 487, pp. 4-8.

20. **Buckellia brevicornis** (Williston), 1884, Trans. Amer. Ent Soc., 11: 22. A.S.U.C. Lodge, near Boulder, July 1, 1932 and July 16, 1933 (James); Science Lodge, Boulder Co., Colo., July 15, 1939 (Lanham).

STENOPOGON Loew

Bromley, 1937, Jour. N. Y. Ent. Soc., 45: 291-309.

21. **Stenopogon inquinatus** Loew, 1866, Cent., VII, 47. Widespread. Recorded by C. J. D. Brown from Mesa Verde National Park. Hesperus; Francis; La Posta; Lonetree; Juanita; Glade Park; Delta; Monte Vista; Boulder; Lee Hill, near Boulder; Ward; Larimer Co., west of Horsetooth Mountain; Las Animas; Denver; Saguache. Late May to July.

22. **Stenopogon rufibarbis** Bromley, 1931, Ann. Ent. Soc. Amer., 24: 431. Lonetree, June 1, 1934 (Rotger); Trujillo, May 17, 1934 (Rotger); Glade Park, June 23, 1938 (Lanham & Bauer); Boulder Co., July 10, 1926 (C. H. Hicks).

23. **Stenopogon obscuriventris** Loew, 1872, Cent., X, 30. Durango; Trujillo, La Posta; Tiffany; Lonetree; Glade Park; Boulder Co.; Ft. Collins; Larimer Co., west of Horsetooth Mountain. May to July.

24. **Stenopogon martini** Bromley, 1937, Jour. N. Y. Ent. Soc., 45: 303. Creede, Aug., 1914 (S. J. Hunter), det. Bromley.

25. **Stenopogon aeacidinus** Williston, 1886, Trans. Amer. Ent. Soc., 13: 289. Recorded by Back from Bear Creek Canyon and from Denver (Osten Sacken). Platteville, Aug. 1, 1915 (C. R. Jones); Ordway, July 28, 1933 (Helen James); Burlington, July 27, 1933 (Rodeck and James).

26. **Stenopogon subulatus** (Wiedemann), 1828, Auss. Zweifl. Ins., I, 375. Recorded by Bromley from Colorado.

27. **Stenopogon consanguineus** Loew, 1866, Cent., VII, 48. Recorded by Back from Rocky Ford and by C. J. D. Brown from Ute Mountain (Tanner). Common on the eastern Colorado plains. Pinon; Roggen; White Rocks, near Boulder; Ft. Collins; La Porte; Chivington; Granada; Boulder Co. Late June to October.

28. **Stenopogon latipennis** Loew, 1866, Cent., VII, 49. Recorded by Bromley from Colorado.

29. **Stenopogon neglectus** Bromley, 1931, Ann. Ent. Soc. Amer., 24: 430. Paratypes from Creede. Widespread in the mountains: Villa Grove; Francis; Arboles; Hesperus; Pagosa Springs; Lonetree; Antonito; Gunnison; Home; Virginia Dale; Red Rocks Park, Morrison. June to early Sept.

30. **Stenopogon picticornis** Loew, 1866, Cent., VII, 45. Recorded by Back from the Denver Highland. Foothills and mountains: Boulder; Inspiration Point, near Denver; La Porte; Ft. Collins; Lonetree; Allison; Pagosa Junction. July to early Sept.

31. **Stenopogon coyote** Bromley, 1931, Ann Ent. Soc. Amer., 24: 429. Paratypes from Salida, Poncha Springs, and Garden of the Gods (Colorado Springs). Owen's Lake, near Valmont; Ft. Collins; Horsetooth Mountain, Larimer Co.; West Lake; Buena Vista; Lonetree. June to Aug.

32. **Stenopogon helvolus** Loew, 1874, Berl. Ent. Zeit., 18: 355. Boulder; La Porte; Denver; Two Buttes; Las Animas. July and Aug.

33. **Stenopogon uhleri** Banks. Holotype from "hills west of Denver."

OSPRIOCERUS Loew.

Bromley, 1934, Ann. Ent. Soc. Amer., 27: 81.

34. **Ospriocerus abdominalis** (Say), 1824, Long's Exped., App. 375. Recorded from Colorado Springs by Tucker, from Spanish Peaks and Colorado Springs by Back, and from Mesa Verde National Park by C. J. D. Brown. Common: Delta; Grand Junction; Arboles; Cortez; San Luis; Mesade Mayo, near Tobe; Grover; Boulder; Ft. Collins; Horsetooth Mountain, Larmier Co.; La Porte; Mishawauka, Larimer Co. June to Oct.

35. **Ospriocerus minos** Osten Sacken, 1877, West. Dipt., p. 291. Holotype from Golden. Ft. Collins, Aug. 10, 1937 (James) and Sept. 23; Grand Junction, July 3, 1932 (L. G. Davis); Cortez, July 20, 1933 (K. Maehler); Allison, July 27, 1936 (Rotger).

MICROSTYLUM Macquart

Bromley, 1934, Ann. Ent. Soc. Amer., 28: 81.

36. **Microstylum galactodes** Loew, 1866, Cent., VIII, 44. Las Animas, July 12, 1931 (Leonard Sweetman).

LAPHYSTIA Loew.

Curran, 1931, Amer. Mus. Nov., 487, pp. 10-19.

37. **Laphystia limatula** Coquillett, 1904, Proc. Ent. Soc. Wash., 6: 180. Arboles, 6000', July 4, 1938 (Rotger); La Posta, June 22, 1936 (Rotger); det. Bromley.

38. **Laphystia rufiventris** Curran, 1931, Amer. Mus. Nov., 487 p. 17. 1 female, 5 miles north of Delta, June 30, 1938 (R. Bauer). Originally described from a single greased female from Green River, Wyo. The present specimen has the head, thorax and the sides of abdominal segments 1 to 6 densely grayish pollinose; on the abdomen, the pollen extends inward in the form of triangles on the posterior parts of the segments, but the triangles of each segment are separated from each other by fully half the width of the abdomen, and there is no indication that they may join to form cross-bands. Some pile on the abdomen is black.

39. **Laphystia lanhami**, n. sp. **Male.** Head black in ground color, wholly covered with dense whitish pollen; pile abundant, particularly on the face and lower part of the occiput, wholly white; mystax white. Front deeply incised. Antennae black, white pilose and whitish (or light grayish) pollinose; the conspicuous bristles at the apex of the first segment yellowish; the ratio of the three antennal segments and the style 5:5:10:2 the style about as long as broad. Thorax black, densely pollinose; the appressed pile and pollen on the dorsum on the upper part of the mesopleura with a distinct yellowish cast, on the other parts of the thorax whitish; bristles of the dorsum yellow, pile and bristles otherwise white; dorsum without noticeable erect pile. Coxae black, densely white pollinose; trochanters black,

shining except for the apices of the posterior pair. Front femora black, except the narrow apices and the basal part (extreme base only above, about the basal fourth below), which are reddish yellow; middle femora reddish yellow, blackened on the apical third to half above, the black sometimes forming a more or less indistinct complete ring apically: hind femora reddish yellow, blackened above except at extreme base, sometimes blackish below at apex; the black areas noticeably whitish pollinose. Tibiae black, the bases reddish yellow; tarsi black. Pile and bristles of legs white. Wings hyline, with a slightly brownish tinge; veins brownish yellow, more yellowish toward base. Halteres reddish-yellow. Abdomen black, the sides of the dorsum with dense white pollen which expands above the posterior margins of the segments and forms apical cross bands on the seventh, usually on the second and third, and sometimes on other segments. Venter wholly whitish pollinose. Genitalia black. Length, 8.5-10 mm.

Female. Similar to the male, except sexually. The broader abdomen has the pollinose bands more uniform; in the specimens before me, they are complete on segments two, three, four, and seven.

Holotype, male, Delta, Colo., June 27, 1938 (R. Bauer); **Allotype**, female, Delta, Colo., July 3, 1938 (U. Lanham); **Paratopotypes**, 10 males, 7 females, Delta, Colo., June 25, July 3, and July 5, 1938. (Lanham, Bauer).

The coloration of the legs is different from that of any other species known to me. In Curran's key, it does not run satisfactorily beyond couplet 2, since the posterior femora are reddish on the basal half below but on less than the basal third above. If we choose either alternative and try to run it further in the key, we get into difficulties because of the variability of the abdominal bands (at least in the male). In one male of my series, there is no trace of a complete band on any segment but the second, whereas in another male specimen only the sixth segment lacks the complete band.

PSILOCURUS Loew

Curran, 1931, Amer. Mus. Nov., 487, pp. 8-10.

40. **Psilocurus nudiusculus** Loew, 1874, Berl. Ent. Zeit., 18: 370. Cheyenne Wells, July 27, 1933 (Rodeck & James).

DIOCTRIA Meigen

Melander, 1923, Psyche, 30: 212-216.

41. **Dioctria pusio** Osten Sacken, 1877, West. Dipt. p. 288. Recorded from Colo, without locality, by Williston.

DICOLONUS Loew

42. **Dicolonus sparsipilosum** Back, 1909, Trans. Amer. Ent. Soc., 35: 247. Cotype from Colorado, without citation of locality. Seven miles south of Glade Park, June 23, 1938. (Lunham and Bauer).

(To be concluded in the April issue)

REPRINT PRICES

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

Pages	1-2	3-4	5-8	9-12	13-16	17-20	21-24	25-28
50 copies	$1.10	$1.40	$3.85	$5.25	$7.45	$ 9.65	$11.85	$14.05
100 copies	1.40	1.65	4.15	5.80	8.00	10.20	12.40	14.60
200 copies	1.65	2.20	4.95	7.15	9.35	11.55	13.75	15.95
100 Add'n'l	0.55	1.10	2.20	3.30	4.40	5.50	6.60	7.70

Tables—for setting up—$1.25 per page extra.

Covers, per 100—$2.50

Fifty copies of reprints are free to the authors provided at least 50 copies are purchased. Reprints should be ordered in lots of 50 or multiples thereof.

Postage or express charges on carriage of reprints are extra

PRICE OF BACK VOLUMES

Volume 1 ----------$2.00

Volumes 2 to 7 inclusive ---------- 1.00

Volumes 8 to date ---------- 1.50

Subscriptions for back volumes or numbers should be sent to the Secretary-Treasurer, Entomology Department, Kansas State College, Manhattan, Kansas.

CONTENTS OF THIS NUMBER

James Walker McColloch. Geo. A. Dean ---------- 1
Notice of Seventeenth Annual Meeting ---------- 2
Some Recent Works on the Classification of Immature Insects. Wm. P. Hayes ---------- 3
Field Infestation of Wheat by Insects Attacking It In Farm Storage. R. T. Cotton and T. F. Winburn ---------- 12
New Records of Lepidoptera for Sumner Co., Kansas. (Note). Don B. Stallings ---------- 16
An Apterous Female Photinus (Coleoptera, Lampyridae). John Wagener Green ---------- 17
Two New Species of Erythroneura. R. H. Beamer ---------- 18
Additional Notes on **Galguph Loboprostethia** Sailer. R. I. Sailer 19
A New Corixid From China. H. B. Hungerford ---------- 20
New Records of Butterflies for Kansas (Note). Don B. Stallings ---------- 21
Insect Infestation In Railway Box Cars In Which Wheat Has Been Shipped. Temple F. Winburn ---------- 22
The Alfalfa Plant Bug, **Adelphocoris Lineolatus** (Goeze), Found In Kansas. Charles Curtiss ---------- 25
A Freak Butterfly. (Note). Don B. Stallings ---------- 26
The Robber Flies of Colorado (Diptera, Asilidae). Maurice T. James ---------- 27

JOURNAL OF THE KANSAS ENTOMOLOGICAL SOCIETY

A quarterly journal published in January, April, July and October devoted to Entomology in the Western Mississippi Basin and the proceedings of the Kansas Entomological Society.

Manuscripts for publication may be sent to any of the publication committee.

The Kansas Entomological Society does not make exchanges since the Society does not maintain a library.

Subscription to the Journal must be paid in advance. The subscription rate is so low that second notices are not ordinarily sent out.

Payment of Canadian or other foreign subscriptions and bills must be made by international Postal Money Order or by a draft on a New York bank and payable in U. S. A. dollars.

Subscribers are urged to give us their full cooperation in these matters.

Subscriptions should be sent to the Secretary-Treasurer, Entomology Department, Kansas State College, Manhattan, Kansas.

Subscriptions in the U. S. A.,	**$1.50 per year**	**Single Copy**
Canadian or foreign subscriptions,	**1.75 per year**	**60 cents**

KANSAS ENTOMOLOGICAL SOCIETY

President, R. L. Parker, Manhattan
Vice-President, Don B. Whelan, Lincoln, Nebraska
Secretary-Treasurer, Donald A. Wilbur, Manhattan

Volume 14, No. 1, January, 1941